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Special Remarks on Evolution.

By T. S. Bulmer, M.D., F.G.S.A. &c.

I shall now offer a few remarks on ascent of type, evolution, and development of brain in the animal scale. First, so far as we can test Nature's processes by observation and experiment, she is known to proceed by the method of evolution—" evolution" says Dana "explains much," his views are, that the present state of Knowledge, favours the theory, that the evolution of the system of life went forward through the derivation of species from species according to natural methods not clearly understood, and with few occasions for supernatural intervention; and when arrived at a certain maximum of variation, another leap would entirely alter its physical shape and habits.

Aristotle was nearly the first of evolutionists when he writes thus, "The embyro of man, or horse, or other animal, is not at first man, or horse, or other animal, but only assumes the specific form, at a final stage, being first living thing, then animal, then special kind of animal" (D.G. ii. 3,4; ii. 6,9,29; iii. 9, 2.)

The starting point of Life is a single cell—that is to say, a microscopic bag, filled with liquids and granules, and having within it a nucleus, or smaller sac.

Paley remarked, that in the early stages, there is no difference discern-

ible between a frog and a philosopher. It is very true ; truer than he conceived. In the very first stage, both the Batrachian and the Philosopher are nothing but single cells, or a monad ; although in the one case it developes into an Aristotle or a Newton, whilst on the other hand it is arrested in its development, and gets no higher than the cold, clammy croaking animal, which boys pelt, anatomists dissect, and French eat.

The theory of descent, says Cooke in his Boston Lectures, is without doubt a great inductive law, based upon all biological experience. Prof. Jevons (Work, Vol. ii. p. 461), says he "believes the eye was gradually developed." Huxley decidedly affirms that "if the evolutionary hypothesis is true, all living matter must have arisen from non-living matter." If on the other hand the formation of matter by the nebular system is correct, then again living matter organised itself at the expense of non-living or inert matter ; for the present form of life could not exist in a gaseous form.

The evidence in favour of the general theory of development and evolution is steadily increasing, as is also the evidence for that special theory, so little liked by many, which regards man as literally akin to the other members of the animal world.

Some persons imagine that it is repugnant to our feelings, and to Nature that we should descend from an inferior stock. Nature, however, never concerns herself in her dealings as to Man's dignity. Dissent from the general doctrine of evolution can only arise either from ignorance of some special department of science, or from a bias of feeling against the doctrine, "Choose your hypotheses, I have chosen mine, and I refuse to run the risk of insulting any sane man, by supposing, that he seriously holds such a notion of that of special creation."—(Huxley).

If the evolutionary theory is true, as we have no doubt, then we are all descendants of species that lived prior to the Chalk age.

The first traces of the primordial stock whence man has proceeded need not be looked, or sought for in an epoch more distant from the age of the *Elephas primogenius*, than that is, from us, by those who entertain any form of the doctrine of progressive development in the newest tertiaries. Roscoe, in his Science Lecture, asserts that "Evolutionism has a large amount of truth in it." However, I leave that theory to be proved by future ages, the same as the astronomical one of Galileo, and the Newtonian theory of gravitation were.

If anyone should object to, or deride the doctrine of evolution, or successive development of the animated forms which constitute that unbroken chain which extends from the Silurian Sea to the present cycle of time, let him seriously reflect, that he has, himself, passed through modifications the counter part of those he disputes as much as he has for nine months been a water breather, or of aquatic habits, and during that time, has undergone seven correlative changes.

Holiday Rambles in the Australian Alps.

By James Stirling, F.L.S., F.G.S., Etc.

PART IV.

This spur on the crest of which we are now standing proceeds from the Buninyong range. I have drawn your attention to the shales and conglomerates which appear to dip under the limestone, and to the fact that we have here a possible clue to the relations of the Mt. Tambo conglomerates, sandstones, shales, etc., with the Bindi limestones, but we must satisfy ourselves—first, that these beds of shale and conglomerate do really underly the limestones; and secondly, that the former are the equivalents of the Mt. Tambo series. And in order to do this we must carefully examine the stratigraphical relations and lithological character. Let us then compare the geological features of these rocks with that of a similar formation elsewhere, *i.e.*, let us co-relate these Bindi limestones and their bounding rocks with the Buchan limestones some 20 miles distant. I have here a very complete geological description of the Buchan beds written by an accomplished geologist* from which we may obtain some useful data to enable a comparison to be made between the rock masses forming the basin in which the Bindi and Buchan limestones respectively rest. While I am reading will you kindly break off a sample of the shale, and yon mass of conglomerate, and compare them with the description of the rocks underlying the Buchan beds. "The Buchan limestones are therefore only part of a continuous series, the lower part of the group consists of coarsely aggregated felsitic breccias, the coarseness of materials decreasing, but with alternations of texture in ascending." The deposits also become more distinctly bedded in places, as at Butchers Creek, pass into, or alternate with subordinate conglomerates in which angular or rounded fragments of sedimentary rocks are of common occurrence. All the late, and in many of the earlier beds aqueous arrangement is clearly distinguishable. The coarse angular breccias at the base indicate, I think, a shore line. You remark that the angular breccias are absent in the conglomerate you have examined which is evidently made up of waterworn pebbles and flattened boulders in a cement of sandstone, and that the shale is clearly a sedimentary rock. And you do not think the general lithological characters are in many respects identical with the rocks under the Buchan beds. Yes, I

* A. W. Howitt, F.G.S., on "Devonian rocks of North Gippsland." Prog. rep. Geo. Sur. Vict., vol. V. p. 127.

agree with you, my friend, the rocks are entirely dissimilar, but still we must not judge too rashly. We will now stroll round the edge of the limestones on the fall towards the Tambo river. Stay: here is an alteration in the rocks, the conglomerates are becoming porphyritic, *i.e.*, they are seen to contain small translucent quartz crystals associated with the base or magma which binds together the conglomerate mass. Let us carefully examine that bluffy outcrop of red or purple-coloured rock to the east of us. It is certainly a prophyry without doubt, and evidently a plutonic mass quite distinct in mineral character and mode of occurrence from the sedimentary rocks we are examining. The mass is pointed but is certainly unstratified. We have here a short, sharp, clear and definite passage from the comparatively unaltered conglomerates to the densely crystalline quartz porphyry. And there is no doubt that the latter is an intrusive rock—*i.e.*, a once molten mass injected into the earth's crust from probably deep-seated sources, melting and absorbing the other rocks in its upward passage, and consequently younger in point of age than the sedimentary rocks it has replaced as well as displaced.

Our talented friend, Mr. Howitt, F.G.S., has informed us* that the great mass of "Snowy River Poryphyries" to the east of us "are older than the middle Devonian Buchan beds which rest upon them;" and which may represent the Lower Devonian formations, hitherto unrecognised in Victoria, so that our intrusive porphyry is hardly identifiable with the Snowy River trap rocks. Let us ramble down this small gorge to lower levels—to where the limestone beds are seen to present a somewhat cliffy aspect. There we have another proof of the intrusive character of our quartz porphyry in the induration and alteration of the limestone beds at contact. See how they have been converted into whitish crystalline and subcrystalline marbles for a distance of 10 or 12 feet from the contact.† Now it is evident that our porphyritic rocks are dissimilar in character to those at Buchan, and that they have an important bearing upon the past history of this part of the earth's crust. This gully we are now ascending will bring us to a spur dividing the Bindi Creek from Old Paddock Creek, and near the crest of the ridge we will examine more closely the sequence of the limestones, shales and conglomerates. That was a stiff climb, and you say you feel a slight sensation of nausea. It will soon pass away, and you will feel better and breathe more freely in a short time. While we are resting, do you know that it is stated that this mountain sickness is not unusual with tourists at Alpine heights, and has been ascribed to diminished pressure of the atmosphere, and an insufficient supply of oxygen to remove effete matters from the system ‡ I have felt it when making rapid ascents of the higher regions in the Australian Alps, when anxious to get over as much ground as possible in a limited time. Here is a small cliff section laid bare by the denuding action of the rains, frosts and snows. The lower calcareous bands are brownish earthy limestones resting conformably on soft yellowish shales, while the latter rest also conformably on the brownish grey and purple conglomerates. Now to what conclusion would

* "Diabase Rocks of the Buchan Dist." Trans. Roy. Soc. Viet., 1881. A. W. Howitt, F.G.S.

† "Notes on the Bindi Marble Beds." Prog. Rep. Geo. Sur. Vict. Vol. vii., p. 107. J. Stirling.

‡ Dr. Tripe, on "Relations of Meteorological Phenomena to Health." Q. T., Mel. Soc. Vol. 10., p. 277.

this sequence of the strata lead us? Simply this, my friend—that unless we imagine the whole series of limestones, shales and conglomerates to have been turned topsy-turvey—a sort of geological somersault—so that the older beds became uppermost, and the younger lowermost, of which there are no evidences. I think we must admit the greater antiquity of the shales and conglomerates, and if the latter are found to be identical in lithological character with the masses occupying the crests of Mt. Tambo, then we may consider the latter as either the lowest members (at this place) of the middle Devonian series; as part of the missing lower Devonian; or as forming the uppermost group of a series of passage beds connecting the Devonian and upper Selurian formations, and analogous to the Deveno-Selurian formation of Prof. Hull, the Director-General of the Geological Survey of Ireland.* Were we to travel together over yon range of mountains dividing the Tambo and Buchan rivers, towards the Limestone Creek Valley (the sources of the Murray) we should find at the latter place bands of marble slate, etc., containing fossils of upper Selurian age.† And it is not improbable that the intrusive quartz porphyries near us are the cause of the apparent hiatus between the upper Selurian and Devonian formations, having cut off and absorbed the intervening passage beds. However, we will reserve further discussion on this point until we have examined the whole of the rock masses which bound the Bindi limestones. So far we have shown on Palæontological evidences that the marine limestones of Bindi are Devonian, and that the lowest members of the series of limestone beds contain fossils of a species which have survived the lapse of time since the upper Selurian sediments were deposited. It now remains for us to prove on stratigraphical and lithological data that the conglomerates and shales of Mt. Tambo were formed prior to these marine Devonian limestones.

(To be continued.)

The Mystery Cleared Regarding Winds, Tides, and Currents.

By Robert Kilpatrick.

No satisfactory explanation has yet been offered of either winds, tides, or ocean currents. This is admitted on all sides, almost without a dissentient voice. Some writers on physical geography themselves acknowledge that the true cause of winds and currents has yet to be suggested. The theories hitherto advanced do not meet the requirements of the case; they are partial, incomplete, and unsatisfactory. Lieutenant Maury, in the "Physical Geography of the Sea" in his chapter on the Gulf Stream, admits this with

* "On the Deveno-Selurian Formation." Q. S. Geo. Soc., vol. 37, p. 100. Prof. Hull, F.G.S.

† "On Caves, Limestone, etc." Trans. Roy. Soc., Vic., vol. , p. . J. Stirling, F.L.S.

reference to ocean currents. In paragraph eighteen (18) he says—"The facts from observation, on this interesting subject, afford us, at best, but a mere glimmer of light, by no means sufficient to make any mind clear as to the sufficiency of any of the causes generally assigned for this wonderful stream." As the Gulf Stream is only the continuation of the great equatorial current flowing regularly and constantly from east to west across the Atlantic Ocean, this remark inferentially applies to it, and similarly to all the currents of the ocean, flow in whatsoever direction they may, seeing they are all dependent upon each other, and form but the parts of one stupendous whole. The only cause which Maury has been able to assign in partial explanation of these phenomena, is heat. He admits its insufficiency, however, and shows that some yet unacknowledged force must be revealed to account for their production, which force he estimates as "at least sufficient to drive at the rate of three miles the hour ninety thousand millions of tons up an inclined plane having an ascent of three inches to the mile." Heat he considers inadequate to the performance of this duty. Where then is the *primum mobile* to be found?

And heat is not only insufficient to put the great equatorial currents ui motion at the rate with which they move, but neither can axial rotation by any means be made adequately to explain the westwardly direction of their motion at the velocity which they uniformly maintain. Maury certainly states that as the result of heat we should have "a perpetual and uniform system of tropical and polar currents," and axial rotation should have the effect of giving all the currents from the equator to the poles "an eastward tendency, and all from the poles to the equator a westward." But whilst this is theoretically correct the *high velocity* and *direct* westward motion of the great equatorial currents are an acknowledged mystery, seeing that the influence of axial rotation on currents travelling from inside the tropics towards the equator is practically nil; and Maury does not anywhere attempt to suggest an adequate cause for these phenomena. Hughes in his text book makes the very same remark as quoted above from Maury, but immediately afterwards he goes on to say that heat and axial rotation "will account for the existence of ocean streams or currents, and explain their *general* direction," such general direction being "within tropical latitudes to the westward, within temperate latitudes to the eastward." These conflicting statements are evidence of a confusion of ideas arising from the failure hitherto to state a theory which will properly account for the existing facts.

With reference to the winds, Maury admits that there are many things hard to be understood, and impossible of explanation by any theory on the subject which has yet been suggested. In his chapter on the Atmosphere he points out that Halley's theory, which with trifling modifications has been adopted by nearly all subsequent writers on the subject, is not conclusive. In paragraph 128 he states as follows:—"Halley, in his theory of the trade winds, pointed out the key to the explanation so far of the atmospherical circulation; but were the explanation to rest here, a north-east trade wind extending from the pole to the equator would satisfy it; and were this so we should have on the surface no winds but the north-east trade winds on this side, and none but south-east trade winds on the other side of the equator." Maury goes on to show that such is not the case, and the reason of the deviation he confesses to be unable to explain. He informs us that a particle of air setting off from the polar regions, "for some reason which does not appear to have been very

satisfactorily explained by philosophers, instead of travelling on the surface all the way from the pole to the equator, travels in the upper regions of the atmosphere until it gets near the parallel of 30 deg." Here this upper current meets with an opposing current from the equator, and by their pressing against each other a calm and an accumulation of the atmosphere is produced. In this calm region the barometer stands higher than it does either to the north or to the south of it, which is a proof of the banking up of the atmosphere in this latitude. "We can understand," he says, "why there should be an uprising of the air which the two systems of trade winds pour into the equatorial calms. But when this air commences to flow towards the poles as an upper current, we cannot understand why it should not continue gradually to descend and turn back all the way from the equator to the poles, nor, as far as investigation has gone, has any explanation been suggested for the calm belts of the tropics; nor can we tell why the upper currents should meet at one parallel in preference to another. But the fact of a meeting and a preference is certain."

What we require then is a theory which will explain the westward tendency of both winds and currents in tropical regions, and at the same time show sufficient cause why an upper instead of a surface current of air moves from either pole to the tropics producing the calm belts of Cancer and Capricorn. If it can be shown that each of these phenomena is attributable to the same cause the theory will be a complete one, and it will be what correct theories always are, viz., simple and easy of application. It is somewhat strange that no attempt has been made hitherto to suggest a cause. Unfortunately, Halley's theory has been adopted, without sufficieient grounds, by nearly every subsequent writer, and therefore, instead of looking for a different *cause*, vain attempts have only been made to reconcile or adapt his theory to the other unexplained phenomena. Let us, however, for a moment enquire how far heat and axial rotation in tropical regions does account for the existence of the north-east and south-east trade winds. No one will be found to question the fact that the sun's heat is the cause of the trade winds moving towards the equator, and that if the earth were at rest these winds would blow from north to south in the northern hemisphere, and from south to north in the southern hemisphere. But does axial rotation in these latitudes impart to them their westward tendency. Of course, it must do this in some degree, but is it sufficient for the purpose? A very simple calculation will show whether such is the case. Take the north-east trade for example. Uninfluenced by diurnal rotation it would move along the meridian say at the rate of twenty (20) geographical miles per hour, making an angle of 90 deg. with the equator. The angle actually made by this wind with the equator on an average in the Atlantic Ocean is 23 deg. Supposing this wind to start from latitude 30 deg., which is its extreme limit, in three (3) hours it would reach the parallel of 29 deg., travelling along the meridian at the assumed rate. In order to cut this parallel at an angle of 23 deg. instead of 90 deg., how far must the earth have slipped from under it towards the east? In other words, how much should the velocity of rotation have increased in passing from 30 deg. to 29 deg. north latitude? Without going minutely into the calculation, but just taking a rough estimate, it will be admitted that the increase should amount to at least 120 miles, or 40 miles per hour. Now the actual increase does not exceed 6 miles per hour in this latitude, and it rapidly diminishes for each degree to almost *nil* as we approach the equator. Therefore, as the result of axial rotation only, the equatorial winds

commencing at the tropics would deviate but a few points of the compass from north or south and gradually approaching more and more nearly to due north and south winds respectively would finally end as such where they cease and ascend on the confines of the equator itself. Through their whole course, however, the trade winds are on an average N.E. and S.E. winds, axial rotation simply operating to make their angle of inclination slightly larger at the tropics than at the equator. Such being the limited extent of the influence exercised by axial rotation on currents of air between the tropics, the theory advanced in explanation of the trade winds does not meet the requirements of the case as already affirmed.

Having seen that there is in reality no theory whatever as yet suggested which explains the general circulation of the waters of the ocean, or of the atmosphere which surrounds our globe, let us enquire in what manner the influence of the sun and moon is exerted on both air and water. The attraction of these bodies would have no effect whatever on anything on the surface of the earth *directly* under them, for the force with which any object is attracted towards the centre of the earth is always greater than the attraction of the sun and moon, even when in conjunction. If this were not the case, then everything moveable would be drawn away from the earth altogether, never to return. But the attraction of the sun and moon must exert great influence on those parts of the earth which are 90 deg. distant in every direction from the points on the earth's surface lying in the straight lines joining their centres with that of the earth, *i.e.*, the points directly under the sun and moon respectively, because the force which they exert on those parts and the force of gravitation towards the centre of the earth are here acting at right angles to one another instead of in opposite directions. Particles of air, therefore, at either pole being operated upon by two forces at right angles to each other, will obey neither the one nor the other, but will move in a line between, that is, they will rush from the pole towards the equator. The influence thus exerted will be greatest in amount at either pole—possibly the only force to be overcome here is friction—and it will diminish in intensity as the equator is approached. A glance at a terrestial globe will show that practically the minimum of this force would be reached at about 30 deg. north or south. Indeed, the whole torrid zone may be regarded as being directly under the sun and moon. A line joining either tropic with the centres of the earth and sun or the earth and moon would diverge very little from a straight line, and, therefore, little or no motion would be the result. Here, then, we have evidently a cause —a combination of forces overlooked by scientists in this connection— which satisfactorily explains the upper current in the atmosphere, known to exist in extra-tropical regions, and the reason for which has hitherto proved so "hard to conceive." The sun and moon are constantly employed in pulling the air away from the polar regions and piling it up at the tropics. At these parallels there must therefore be an increased barometrical pressure, the result of which is that as the sun and the moon can only operate on one side of the earth at a time a surface current is forced to move from the "horse latitudes" towards the poles. This surface current being in extra-tropical regions, where the difference of measure in the earth's circuit on successive parallels is very marked, will of course be considerably affected by axial rotation. This, and the direction in which the pressure of the atmospheric tides is exerted, with perhaps other causes,

will make them south-west and north-west winds, instead of being otherwise due south and due north winds respectively.

Within the tropics everything on the earth's surface is passing and repassing under the influence of the sun and moon at the rate of 1000 miles an hour. Here their attraction exerted in the manner explained above can only make itself felt in *retarding* the motion of both air and water, and thus giving to each a westward tendency. And as air is much more easily moved than water, their effect in retarding the atmosphere in equatorial regions must be considerably greater than their effect upon the water of the ocean. This will account for the westward tendency of both wind and currents, and the mobile nature of air explains the greater velocity of the former. It is in this zone that the sun's heat operates as an agent on the motions of both air and water. Its effect is of course also much greater on the atmosphere, and hence, by rarifying the air at the equator and thus causing an upward motion, it is found sufficient to make the trade winds north-east and south-east winds in their respective hemispheres, instead of blowing from east to west as they would otherwise do if not affected by heat. The upper and return currents from the equator to the tropics will also have *easting* in them being retarded as before mentioned. They will therefore blow from the S.E. in the northern, and the N.E. in the southern hemisphere. At the tropics these currents will strike against the immense wall of air which is here erected and sustained by successive atmospheric tides flowing from the poles. Here they must descend and move off again towards the equator as the north-east and south-east trades once more; and so on ascending at equatorial and descending at tropical calms continually.

The waters of the ocean are, comparatively speaking, but slightly affected by the heat of the sun. The general direction of equatorial currents therefore, whilst corresponding with the upper currents of the trade winds, will be more from east to west. The intervention of land running from north to south causes them to be deflected out of their course and gives rise to the Gulf Stream, the Japanese, and other currents. The surface currents from the poles are to be accounted for in the same way as the upper current in the atmosphere, viz., by the attraction of the sun and moon acting at right angles to that of gravitation towards the centre of the earth. These polar currents are easily set in motion, as nothing but friction has to be overcome. By this means the surface waters of the polar regions are drawn towards the tropics to supply the place of the warmer waters from equatorial regions which force their way to the north. Making the necessary allowances, therefore, for the intervention of land, and water also being less easily affected by the sun's heat than air, the general direction of the surface currents of the ocean should be found to correspond with the direction of the upper currents of the atmosphere as already described, and that such is the case a careful examination of Maury's charts will demonstrate.

That the attraction of the moon is sufficient to put the great equatorial currents in motion from east to west, and thus give rise to the Gulf Stream flowing to supply the place of the polar currents travelling towards the equator, any student of astronomy will admit. To prove this by reference to authority would be superfluous. Attention has therefore been directed to two existing forces, recognizable by all, the combined operation of which explains the whole of the movements taking place in our atmosphere, and also the general direction of oceanic currents. The

theory suggested is therefore a complete one, inasmuch as it is applicable to all the phenomena of both winds and currents, and without adducing anything further in its favour it is now only necessary to enquire whether it is also applicable to the phenomena of the tides.

The explanation given of the tides in our scientific works is certainly unphilosophical. That they depend principally upon the attraction of the moon is true, but that the attraction of that luminary operates upon the waters and the solid part of our earth, as our text books inform us, cannot be admitted. The contention that those parts of the waters of our globe which are directly under the moon's vertical path in the heavens, and hence nearest to that body, are in consequence of the stronger attraction drawn out towards her, and that in this way she causes the waters to flow from other parts to supply their place, has already been disproved. The assertion that the waters on the opposite side from the moon bulge out beyond the general line of the earth's circumference, because they are less strongly attracted than the intervening solid earth which is said to be drawn away from them, is such a palpable absurdity as not seriously to require consideration. A more scientific method of explaining the tides is found in the fact already referred to, that the moon's attraction makes itself felt, not on those parts of the earth directly under her, but on those 90 deg. distant in every direction from her central attractive influence. So that from all sides—north, south, east, and west—the waters rush towards this central point, where they are piled up one upon another, and thus cause high water under the moon, or rather, as will be presently explained, some degrees to the eastward of the meridian over which the moon is vertical. The rotatory motion of the waters to the west of the meridian so far as 90 deg. distant therefrom will be greatly increased, whilst that to the east will be retarded. This causes them to accumulate under the moon, whilst at 90 deg. distant on both sides from the centre of the tidal wave there is low water, with a strong current running from west to east. The tidal wave once formed, it will be found constantly increasing on its western side by waters rushing up from a direction due west between the tropics, from the north-west in the northern, and from the south-west in the southern hemisphere; whilst an equal volume of water must of necessity break away from its eastern side running due east between the tropics, north-east in the northern hemisphere—see direction of the tidal wave at the British Islands when the moon has passed the meridian—and south-east in the southern hemisphere. As the waters accumulate from the west by an increase in their rotatory motion, this tidal velocity will not be overcome till they have passed beneath and to some distance eastward from under the moon, when the counteracting influence offered by their running up hill will be assisted by the retarding influence of the moon's attraction after they have passed the meridian. They are thus brought for a few minutes to a standstill when they have reached their highest point. We therefore have high water at any place not at the moment when the moon is vertical but some hours after she has passed the meridian of that place.

Keeping all these facts in view we can have no difficulty in understanding why there should be high water on the opposite side of the earth from the moon. Did the earth not rotate we should have high water only on one side—that next the moon—and a uniform level would subsist all round on the side most remote from that body. But as the earth does rotate, we find the waters continually drawn away from its western side, and by the

action of gravitation for 20 deg. or 30 deg. arther round the waters are found running down-hill to supply the place of those drawn away by the moon's attraction. As sufficient time is not obtained for gaining a uniform level, we have therefore continually an apparent high water on the opposite side of the earth from our satellite, but which is in reality only the ordinary level of the ocean, low water at both sides giving it the appearance of bulging out beyond the general line of our globe's circumference. As similarly remarked before, what is taken away from the western side to form the tidal wave, is replaced by an equal amount flowing with an equal velocity on the eastern side, so that no diminution in the ordinary level or high water, as it is called, on the opposite side from the moon is to be observed. Slight reference only need be made to the sun's influence on the tides. He exerts a similar force and in the very same manner as has been explained regarding the moon but in a lesser degree owing to his vastly greater distance from our globe. That the phenomena of spring and neap tides are owing to the sun's place in the heaven's with regard to the moon is well known, but particulars need not be discussed, inasmuch as the object of this paper is simply to state the broad principle upon which the explanation of the tides and the motive power of winds and currents rests. Details have, therefore, been most studiously avoided, and in the absence of diagrams many points of interest bearing on the subject have necessarily been left untouched.

Such, then, is the manner in which the sun and moon affect the motions of both air and water on the surface of our globe, and the way in which these motions may be satisfactorily explained. The theory advanced is not partial in its application, but fully accounts for the whole of the phenomena of winds, tides and ocean currents, supplying a felt want, and is deserving the attention of those whose special training opportunities and acquirements render them competent to deal with the subject in all its interesting relations and details.

Connecting Links.

By Heykim Nabi Cosmos.

The connecting link, as generally called, between races, etc., is only arbitrary, as made by Zoologists.—What is considered a link by one, in one way, is not so in another. Links exist variously by analogy of organs, or similarity of certain parts, such as lungs, heart, blood, features, feathers, scales, and habits, etc., whilst in other parts there is the greatest dissimilarity.

Agassiz, as a zoologist, and simply on zoological grounds, assumed that there are several zones between the Ganges and the Atlantic Ocean, each having its own flora and fauna, and inhabited by races of men, the same in kind, but of different origin: when told by philologists that it is impossible, because the language spoken through that wide region demonstrated that all the inhabitants had a common descent, he answered, that "as ducks quack everywhere, he could not see why men should not everywhere speak or have an affinity of the same language."

Why the connecting links have not in certain cases been found, is, because the world has not been sufficiently searched.

However, in future ages, we may yet find the links in the hills of the ocean, when the sea again gives up her bed, and takes possession of our now fertile land, as she has done of yore.

Earthquakes and the majestic power of the ocean have swallowed up millions of people, yet no one has ever yet found the bones of man in the bowels of the earth or sea, for the simple fact that the strata has not been sufficiently searched. It is only for a fortunate combination of circumstances that any particular deposit could give us a fair conception of what life was that existed upon the earth when that deposit was formed. The time will, however, come before long when it shall be thought "wonderful that naturalists, who were so well acquainted with the comparative structure and development of man and other animals, should have believed each to have been a separate act of creation," or, that no links have ever united man and inferior animals. A sudden transition, without a connecting link in the great animal chain, from irrational to rational creatures, is a distinct phenomenon from that passage from a simple to a more perfect animal organization and instinct. To pretend that such a step, or rather leap, can be a part of a regular series of changes in the animal world is to strain analogy beyond all reasonable bounds.

Individuals belonging to one species, separate, and living in different climates, influenced by food, etc., gradually change their form, appearance, and constitution, etc., and at length cannot be known as belonging to original species.

It appears plain to us that there has been a constant oscillation in numbers of species in each genus in the tertiary as compared with the modern epoch. The continual progress that is slowly but surely going on shows an increasing similarity of living fauna—and amongst vertebrates especially—in their increasing resemblance to man from the first appearance of the primary palæozoic fishes.

The Substitution of an Alkaline Base in Chlorimetry.

By John Smyth, Junr., C.E., &c.

In Chlorimetry, I consider that the use of a milky mixture of the sample of a bleaching powder to be tested, is a great inconvenience and a source of loss.

In the case when measured portions of the milky mixture are added to the chlorimetrical substance, there is a loss of the sample, from portions adhering to the hand or other stopper, during the frequent agitations, which are necessary, and there is a difficulty in maintaining an equality in strength, between the earlier and later added portions of the contents of the burette..

The same objections prevail, when a measured portion is taken from a prepared stock mixture of the sample of bleaching powder, and acted upon by the chlorimetrical substance, as agitation is also necessary. In short in any case the reaction is not so palpable and satisfactory with a milky as with a clear liquid.

I was therefore, glad to find a simple method of always obtaining a clear solution of the bleaching powder, containing all its chlorine by merely dissolving it it an alkaline solution.

I was led to adopt this method from the following circumstances. In the north of Ireland a solution of the bleaching salt of soda is used instead of one of lime for the finer fabrics of linen in the bleaching process, since the former liquid parts more slowly with its chlorine than the latter, a prolonged action is secured, and thereby the strength of the fabric is less affected.

The alkaline bleaching liquid has long been manufactured in that district, formerly by the direct addition of chlorine in an alkaline solution; but since the production of bleaching powder at a cheap rate by the reaction of carbonate of soda in a solution of the bleaching powder.

In determining the amount of available chlorine in this liquid from time to time by the usual methods, so much more satisfactory results were obtained than in testing bleaching powder, that I made a number of investigations to determine whether correct and expeditious results could be secured by converting the latter into the former. The result was that, at least as accurate determinations of the amount of available chlorine in the several samples were obtained by this means as by using the milky solution.

As an excess of alkali is no inconvenience in testing, and thereby the liquid settles more readily and is more easily filtered, the usual mode of

procedure is to dissolve 240 grammes of soda crystals ($Na._2 CO._3 + 10$ aq.) in one litre of water. This amount of alkali will be found sufficient for the strongest samples One litre of this alkaline solution will test ten samples of bleaching powder when 10 grammes are operated on, and twenty samples when 5 grammes are taken. I generally weigh out 5 grammes of the samples of bleaching powder, then take 50 C.C. of the above alkaline solution, a little of which I add to the powder in a mortar, and triturate till there results a pasty mass; next the mortar is nearly filled with the alkaline solution, and the contents of the mortar rubbed up again with the pestle and transformed into a beaker. The remaining part of the alkaline solution is used for washing out the mortar into the beaker: water may be used to complete the washing if there be not enough of the alkaline solution.

The contents of the beaker are allowed to settle for a few minutes, and the quickness with which they do so, is a measure of the good quality of the lime used in the manufacture of the bleaching powder. Bleachers much prefer the lime bleaching liquors (solution of bleaching powder), and alkaline bleaching liquors (the liquid I am now describing) which settles quickly. The supernatant liquid is then passed through a filter, and the precipitated carbonite of lime stirred up with some water and then thrown in the filter, the first portion of this filtrate should be received in a separate vessel as soon as the fine precipitate is liable to pass through, but some cease to do so; when these portions can be filtered over again. The beaker and filter is then washed; and the washings are known to be complete when they no longer give a precipitate with nitrate of silver or discharge the blue colour of the dilute solution of indigo. The latter test is the most convenient for bleachers, who generally use indigo for testing their bleaching vats for chlorine, and as the washing is easily effected, is sufficiently accurate.

The filtered liquid to which the washings are first added is then made up with water to 500 C.C. It is easy to know when the liquid contains an excess of alkali, by the addition of a small portion of the lime bleaching liquid (sol. of bleaching powder), which if such be the case gives a white precipitate (carbonate of lime.)

For each examination 50 cub. cent. of this liquid are taken, and the percentage of chlorine determined either by Gay-Lussac, or Penots' method, with arsenious acid, or by Otto's method with protoxide of iron or indeed by the usual methods. In the methods with arsenious acid, I find it a great improvement to dissolve the arsenious acid in glycerine instead of potassa or soda. If there is not time to filter, tolerably accurate results can be obtained by making up the unfiltered liquid to 500 cub. cent., indeed more accurate I consider than by the mere milky solution of the bleaching powder.

Made up of this strength and filtered mere alkaline bleaching liquid is clear and colourless of a sp. gr. 1.007. I have made it, however, of a sp. gr. of 1.233 containing 1 of chlorine to 9 of the liquid, which in this case is slightly green. It has a pleasant oily feeling to the touch, contrasting favourably with the rough unpleasant feeling of the lime bleaching liquor. Its bleaching effect is very much altered by a slight departure on either side from its neutral point (viz., when the addition of either an alkaline or lime solution will cause *no* precipitate.) In the manufacture of this liquid for bleachers, the commercial carbonated soda ash is used with bleaching powder.

The Germ Theory and Milk.

FARMERS have long acquired the reputation of being a steady-going, jog-trot people, tenacious of their supposed supreme traditional right to grumble, even in prosperous times, and hereditarily indisposed to change their ways in matters of practice, or the views in which they were reared that they call their convictions. Modern improvements, which have revolutionised our systems of farming, regarded at first even by the more enlightened as innovations they contemplated with concern, the farmers opposed as new-fangled notions they could not abide, and this expression of opinion was complacenty supposed to stop progress. But "how can they be wise whose talk is of oxen" only? Had any one predicted at a graziers' gathering 200 years ago that Leuwenhoeck's looking through a microscope at yeast was the commencement of a series of investigations that would one day lead to their knowing the agent that causes milk to turn sour, what is the kind of reception that would probably have been accorded to the prediction? Would the graziers have subscribed to a fund for the "endowment of research" on so important a subject, or would they have regarded the speaker as so obviously trying to impose on their credulity that they might justly regard him as a fit butt for their bad eggs? Looking back, however, at the course scientific progress has taken, we see that this is what has occurred. The history is full of interest, and like the good old sermons of three heads under which farmers used to doze, it is a theme which has a practical application. As far back as in the writings of the alchemists of the thirteenth to the fifteenth centuries we find the words "ferment" and "fermentation." The word is clearly from *fervere*, to boil, and was, without doubt, applied in the first place to fermentations accompanied by effervescence, produced by the disengagement of gas during the processes. In the course of time, however, it was also applied to cases where a dissolved organic body is modified or transformed without effervescence, as, for example, in the acidification of wine. We cannot ascertain clearly what exact idea was attached to the word "fermentation;" for the word "ferment" is even applied to the philosopher's stone. This, however, we do know—that these mystetious changes, brought about by some cause quite unknown, possessed a strong fascination for the alchemists, and that they gave much attention to them. Petrus Bonus, of Ferrara, in 1330, drew attention to the fact that a very small quantity of leaven transforms into fresh leaven a large quantity of paste, and likens its action to the supposed action of the imaginary much-sought stone. Direct and definite additions to knowledge about fermentation came slowly, and at wide intervals.

Van Helmont (1648) studied the gases given off. Silvius de la Boë (1659) showed that the effervescence arising from the action of an acid on an alkaline carbonate, as in the familiar seidlitz powder, was of a different character from that arising from fermentation, and Becker (1682) established the fact that saccharine liquids alone are capable of entering into spirituous fermentation. Stahl, the celebrated originator of the phlogiston theory (1697), supposed that a ferment was a body endued with a motion which it transmitted to the fermentable matter; but from his time to that of Lavoisier the whole subject received but little attention. The great impulse given to chemistry by the many important discoveries at the end of last century, and the remodelling of the science by Lavoisier and his collaborateurs, placed, among other phenomena, the study of fermentation on a fresh footing. Lavoisier himself devoted time to it, and he was the first to trace the connection between sugar and the derivatives from it which fermentation produces. But while from this time onwards definite progress was made in our knowledge of the various chemical changes in processes of fermentation, the nature of ferments—the exciting causes of fermentation—remained unknown. The balance and the measure enabled the changes to be followed, but what set up the changes remained as much a mystery as to the old alchemists. Light upon this subject came, however, in a totally different channel. As far back as 1680 Leuwenhoeck had examined beer yeast with the microscope, and noticed "ovoid globules," but he could not determine their nature. Fabroni, in 1787, went a step further, and concluded that "the matter which decomposes sugar is a vegeto-animal substance." Thenard, Gay-Lussac, Colin, Desmazieres, and many others of less note puzzled themselves with the same problem, but without any real advance. Meanwhile, the microscope as an instrument was constantly receiving improvements, and, in 1835, in the hands of that accomplished philosopher, renowned in so many branches of science, Cagniard de Latour, it revealed that yeast is "a mass of organic globules reproducing themselves by buds," and it therefore appeared to him clearly to belong to the vegetable kingdom. The observation of this budding came as a wonder. It excited much attention, and soon the examination of yeast by Schwann, Kützing, Quevenne, Misterlich, Turpin and others gave corroborative testimony, and in the course of a few years the "yeast plant" came to be spoken of popularly. The present generation is so familiar with the name that it is difficult to realise that a little over forty years ago its nature was unknown. As the number of low forms of life that were microscopically examined was extended much discussion arose as to what were animal and what vegetable. The *volvox globator*, among other forms, has been so bandied about from zoologist to botanist, and from botanist to zoologist, that hardly anyone can have escaped hearing about it. Scientific football it has been even derisively named. The yeast plant, however, has continued to be recognised as a plant. Its discovery, though, by no means cleared up all at once the mysteries of the fermentation it produces, and a full conception of the molecular changes that take place is not yet gained. But even the explanation in its broader outlines, now accepted as correct, was not received without severe fighting. The mighty Liebig thundered against it, though a few years before his death he made what was tantamount to a retraction of his views. The establishment of the fact that the yeast plant did in some way produce fermentation, even though dimly understood, led

to enquiries on the same lines with regard to other fermentations. When milk turns sour the sugar of milk which it contains is converted into an acid, and in 1780 Scheele gave to it the name lactic acid. As a chemical product it was well known, and much attention has been given to it from the chemical point of view. In 1857 Pasteur wrote his celebrated "Mémoire, *Sur la Fermentation apellè Lactique*," and this, more than anything else, gave an impetus to the study of what is now known as the "germ theory" of fermentation. This was followed up by his papers on alcoholic fermentation. He distinctly showed the ferments to be organised living bodies. Microscopes now are in everybody's hands, and it is easy to see the life forms on which Pasteur has written so much, and on which there has been such a storm of controversy as to whether they originate spontaneously or not. The war over, "the beginnings of life" has enveloped the subject with a keen interest for many it, perhaps, would not otherwise have had. Future generations may wonder that theological journals should have so warmly taken up the processes of the souring of milk and the brewing of beer, and will admire the calm patience with which men like Lister, Dallinger and Tyndall pursued their tedious and accurate researches on supposed spontaneous generation, heedless of the outside din. One practical outcome of the fray has been that the whole subject has received such a scrutiny that accurate knowledge has been considerably advanced. While it has been well established that there is no proof that these low vegetable or animal forms ever do originate spontaneously, their life histories have also been learnt. To see the vegetable forms which bring about changes in milk is but little trouble. Let some milk be exposed to the air. In a short time it will turn putrid or sour, and after a while will separate, as blood separates into clot and serum. If a drop of this milk be placed under a powerful microscope, movements will be seen due to a vibrio, and a careful watching will detect a minute *Bacterium*, as it is now called. The naming of these low forms has undergone several changes, and the position assigned to them has varied. They are now, however, ranked with the fungi in a separate group—the *Schizomycetes*. Based on differences of their shape they are divided into (1) *Bacteria* proper, oval or slightly elongated; (2) *Bacilli*, rod-shaped; (3) *Micrococci*, round; and (4) *Spirochætæ* spiral. *Micrococci* are frequently found in milk, but apparently produce no change. A *Bacillus* (sometimes called *Bacillus syncyanum)* produces the blue colour in sour milk. *Bacterium lactis* is the cause of lactic fermentation. This last was made known and named by Professor (now Sir) Joseph Lister, who observed it in the course of the studies which he undertook in reference to "germs" in their relation to wounds and surgical operations. The convenient term micro-organism includes all the forms, whether producing glanders, tubercle, enteric fever, fowl cholera, or fermentation, etc. One of the most important branches of modern research is the "cultivation" of micro-organisms under circumstances so that their whole life-history can be watched, an excellent illustration of which was given during the Health Exhibition, in the biological laboratory, under the charge of Dr. Watson Cheyne. Thus, among many "cultivations" which have been effected, it has been found that *Bacterium lactis* can be grown pure in other solutions besides milk, and when inoculated into milk this becomes sour, and coagulates from the formation of lactic acid from the milk suger. A still more interesting point has been proved, which may some day come to have important practical bearings.

Milk may be taken from a cow direct into a flask, the flask plugged with cotton wool, and the milk kept for an indefinite period without undergoing any change, and without producing any organisms. It used to be supposed that it is exposure to the air which causes milk to sour and curdle. This is not so. It is not the air, but the microscopic spores floating in the air, from which the organisms develop which bring about the changes. Tyndall's researches have placed that beyond doubt. Lister hes shown that, if a flask be heated so as to kill any germs that are in it, and plugged before it commences to cool, and the cow is milked under certain precautions directly into the flask while the plug is momentarily removed and replaced, it is found no change occurs in the milk. The "precautions" are that the teats of the cow and the hands of the milker are washed with a fluid that destroys the germs. This is only an application in a particular case of the knowledge that if the organisms which cause fermentation in a certain fluid do not come in contact with that fluid the changes do not take place. Just also as if the orgenisms do not get wafted, or in some way pass to a fluid suited for their own growth, they do not develop, Tyndall has drawn an analogy with seeds and soils. If you sow radishes you do not get corn, and if you sow corn on unsuitable soil it will not grow. Though these micro-organisms are invisible to our unaided sight, they behave in the same way. You may inoculate a fluid with many organisms, and none may grow. The fluid may not be suitable. But a fluid suited to their development will not develop them unless they are introduced in some way natural or intentional. The matter so far is clear, and repeated observations by different experimenters only confirm the conclusions arrived at. The extent of variation in growth according to the "soils," as the fluids are often called, on which the germs fall is a matter still for research. But the mystery of fermentation and of ferments is so far cleared up. Some ferments we regard as friends. They produce changes we desire. Some are our foes. They produce changes where we do not desire them. *Bacterium lactis* is one of these. The dragons of fairy tales that devour many champions fall at last to some observing knight who finds out the vulnerable point. We know that *Bacterium lactis* succumbs to a high temperature, and that among other things bichloride of mercury is certain death. Though at present the application of the knowledge gained has not extended beyond the laboratory, is it too much to hope it will be available in some form more generally? To know with clearness what has to be done is often the half-way to knowing how it is to be done. On a small scale, as mentioned above, it is possible to prevent milk from turning bad for an indefinite length of time. Preventing it on a large scale must follow as surely as the thousands of miles of wire have followed laboratory researches on electricity. The means employed to combat micro-organisms may not be the same as at present employed. The great point so far gained is our knowing what it is that has to be combated. Much remains to be done, not only practically, but scientifically. When Pasteur was last in England, he mentioned to a friend that if he had three years to spare his greatest desire would be to spend them in the laboratory of some dairy working out the relation of germs to milk and cheese industry.

M. S. W.

PROCEEDINGS OF SOCIETIES.

VICTORIA.

THE HORTICULTURAL SOCIETY.

The Horticultural Society of Victoria met in the Eastern Arcade on Wednesday night, the 7th of October. There were present—Mr. W. Anderson, M.L.A. (in the chair), and Messrs. Hutchinson, Bell, Beilby, Carson, Harbison, Jackson, Milton, Tyler, Wilkinson, Ardagle, Bailey, Boyce, Cole, Draper, Murdoch, Pockett, Roberts, and Sangster. Amongst the correspondence received was a letter from Mr. Bedford, dated Leeds, August 26, stating with regard to a consignment of apples which the society had sent to England that he had succeeded in taking 60 per cent. of the apples in good condition to the nursery of Messrs. James Blackhouse and Sons, York. They were pronounced to be mostly finer than those grown in England and true to name. The specimens were exhibited in the shop windows of Selby and were a great attraction to many. Mr. Bedford further stated that Captain Murray, of the Shannon, took much trouble in looking after the fruit during the voyage, and had new and better cases made for them, and had said that he would in future be most happy to take charge of samples to England.

VICTORIAN ACADEMY OF ARTS.

The monthly meeting of the Council of the Victorian Academy of Arts was held on Tuesday the 6th October. Present—Mr. C. Earles (in the chair), and Messrs. Williams, Campbell, Mather, Jas. Robertson, Mackennal, Edwards, Wilson, Carter, and Gibbes. The correspondence

having been read, the draft annual report was dealt with, amended, and ordered to be printed for distribution. The following gentlemen having been duly nominated at last meeting, were now elected associates:— Messrs. C. De Lacy Evans, Thos. Watts, T. Roberts, and H. F. Bruford; and Mr. W. Seehusen was nominated for ballot at next meeting.

MEDICAL SOCIETY OF VICTORIA.

The monthly meeting of the Medical Society of Victoria was held in the society's hall, Albert-street, on Wednesday, the 7th of October- There was a large attendance of members. The president (Dr. Moloncy) occupied the chair. The hon. secretary announced that Dr. Thomas Black had presented to the society the original minutes of the first Medical Society formed in Melbourne, namely, the Port Philip Medical Association, which was established on May 16, 1846. Dr. Black had also contributed to the library the list of the legally qualified medical practitioners of New South Wales in 1842, with the Act of Parliament and Order in Council of 1838 constituting the first medical board of New South Wales. In a letter to the president, Dr. Black stated that he had good reason to believe that the only survivors of the Port Philip Medical Association, and of the original New South Wales list of qualified practitioners, were Sir Charles Nicholson, Bart., now residing in London; Dr. William Campbell, of Russell-strcet, Melbourne; and himself. On the motion of the president, seconded by Professor Allen, a hearty vote of thanks was accorded to Dr. Black for his valuable and interesting gifts. Mr. Power, of St. Kilda, was elected a member of the society; one ordinary and one honorary member were nominated for election at the next monthly meeting. Mr. Bosisto, as an honorary member of the society, read a paper on the materia medica of the eucalypti; Dr. Bowen exhibited an eye in which a piece of quartz had been embedded for thirty years; a paper was read for Dr. Wilmott on a new application of the recently introduced local anæsthetic, cocaine; and numerous pathological specimens were exhibited by Dr. Graham and Professor Allen.

THE FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Field Naturalists' Club was held at thc Royal Society's Hall, on Monday evening, the 12th of October.

Mr. A. H. S. Lucas, M.A., vice-president, occupied the chair.

Messrs. A. C. Curlewis, W. M. Gamble, and J. Pickering, were elected members of the club, and Mr. E. D. Atkinson, C.E., Table Cape, Tasmania, was elected as an honorary member.

A paper was read by Mr. O. A. Sayce, entitled "Remarks on Victorian Gall-making Coccidæ." The author gave the results of his observations

on the life history of several species of minute insects belonging to the order Hemoptera, which cause the numerous galls found on the young trees of the eucalyptus family. His remarks were illustrated by drawings and by slides for examination under the microscope.

The reading of a second paper mentioned on the notice-paper was postponed until the next meeting, in order to allow the members and visitors present more time for the examination of the exhibits of wild-flowers which were made the special feature of the evening.

The inclement weather of the two previous days reduced the number of exhibits; but, notwithstanding this, at least 200 species of native flowers were shown, and considering the great difficulty experienced in keeping examples of the indigenous flora fresh for any length of time, they were in very good order.

Several of the members had obtained flowers from country friends, whilst others had collected during the morning at Caulfield, Brighton, and other localities.

The flowers were arranged in ordinary show-stands, and in most cases had their botanical names, together with those of their natural orders attached.

The principal exhibitor was Mr. C. French, F.L.S., who showed about 80 species from Caulfield, &c., among which were the curious orchids lyperanthus nigricans and prasophyllum elatum; Mr. G. Coghill exhibited about 70 species from Donald, Box Hill, Dandenong Ranges, &c., among which were Grevillea alpina, G. ericifolia, Swainsonias, asters, native violets, &c. Mr. F. G. A. Barnard tabled about 60 species from Doncaster, Ringwood, and Caulfield, including the curious so-called carnivorous plant, utricularia dichotoma, or bladder-wort; also several growing Victorian ferns, lomaria fluviatilis being much admired. Mr. J. E. Dixon showed about 12 species of orchids, including caladenia latifolia. Smaller but interesting exhibits were shown by Miss Campbell, Miss Halley, Messrs. Bage, Best, M'Kibbon, Topp, and Watts. Mr. T. A. Forbes-Leith exhibited a collection of dried ferns from Mount Blackwood; Mrs. J. Simson exhibited some specimens of the Waratah, from New South Wales, and Dr. Lucas, a new fern from Queensland; Mr. Jesse, watercolour drawings of wild flowers; and Mr. Watts, rare marine algæ, from Port Philip and Western Port.

GEOGRAPHICAL SOCIETY OF AUSTRALASIA.

A meeting of the committee of the Victorian Branch of the Geographical Society of Australia was held on Friday, the 9th of October, at the residence of the president, Baron von Mueller. The members present were the president, Messrs. Geo. Gordon, F. Scarr, A. C. Macdonald (hon. secretary), D. Larnach, W. Potter, Captain Pasco, and Dr. Bride. Letters were read from Mr. H. O. Forbes, F.R.G.S., and Mr. H. G. French. The latter gentleman forwarded to Baron von Mueller specimens collected by him in the Kimberly district, Western Australia. Mr. Forbes, to whom Baron von Mueller had sent a copy of his small work on Papuan plants, wrote in acknowledgement of the gift from Port Moresby, under date

September 19, and in the course of his letter said :—" Rest assured that I shall do my very utmost to secure a large collection of high-altitude plants. The Alpine flora of the Malayan mountains has been a source of the acutest pleasure to me for some years past, and I have, since I arrived, looked from the Astrolabe Range across the Owen Stanleys, with most ardent and longing eyes. On my arrival, which I hastened in advance of my Malays by coming with Sir Peter Scratchley, I made a journey of 50 miles into the interior to Sageri, to select a site for my first depot, and now that my carriers and assistants have arrived I am ready to start in a couple of days more for that spot. I shall work steadily inwards from there, and in a very short time I hope to have laid a good foundation of a herbarium. I hope to spend here among these mountains the months between this and December, 1886, at least if I can afford it. With the composition of the expedition—we secured Mr. Hennessy, a very good navigator, and Mr. Anderson (detached from Sir Peter Scratchley's expedition to aid me) as one of my botanical collectors, and with several experienced Amboinese, not new by many years to New Guinean climates—I ought to accomplish some good work. The expedition, however, is handicapped enough for the 'sinews of war.' You must yourself know, that some £1,500 in all, to bring from Europe, and from the Malay Archipelago so large a company, and to support it for nearly two years, is a mere fractional item of the expenses. I am only too glad to work as I have done now for years without remuneration ; but as I have not the means myself to support this work unaided, I hope the friends of science whose servant I claim to be in spirit as in deed, will aid still further the e ploration of this region."

NATIONAL AGRICULTURAL SOCIETY OF VICTORIA.

The monthly meeting of the council of the National Agricultural Society was held on Thursday afternoon, the 13th of October at the society's offices. Present—Mr. J. M. Peck (in the chair), Messrs. Job Smith, F. S. Roberts, D. Mitchell, S. T. Staughton, A. Patterson, W. Thomson, D. R. Macgregor, W Learmonth, D. Munro, T. Learmonth, and J. G. Brisbane. A letter was read from Mr. Byron Moore, secretary of the Victoria Racing Club, in reply to a communication from the secretary of the society, inquiring the charge for certain properties, such as hurdles, water-carts, &c., which the club had lent to the society for the recent show. Mr. Moore stated that the club had great pleasure in rendering the society any assistance, and did not intend to make any charge. It was decided by the council to send a hearty acknowledgement of this courtesy. The committee appointed to make arrangements for the field trial of excavators entered for Sir Wm. J. Clarke's special prizes reported that they had fixed the date of the trial for Wednesday, the 4th of November, at 10 o'clock a.m. The committee appointed to consider the letter from the Secretary for Agriculture as to borrowing money on the security of the site of the show-grounds reported that they had met, and after adequately discussing the matter, they had asked Mr. J. Buchanan, M.L.C., and Mr. C. Young, M.L.A., to see the Premier and place the subject

before him. At the interview Mr. Service asked that a written statement of the history of the society's position with regard to its past and present sites, together with its revenue and other particulars, should be prepared and forwarded to him, when it would be considered by the Cabinet. That was accordingly done, and at the same time a request was made for a loan of £10,000 from the Government, to enable the society to pay off its overdraft and carry out further improvements at the show-grounds, to be repaid in 10 equal instalments. Failing this request being granted, it was asked that the Government should give the society power to offer the security by which the amount required could be borrowed. No reply had been received from the Government. A letter was read from Messrs. W. M'Nab and Bros., of Oakbank, Tullamarine, offering £5 towards establishing a Victorian Ayrshire Derby sweepstakes similar to the one held in Scotland every year. The letter was referred to the show committee. On the motion of the chairman, it was decided to elect Mr. Thos. Bent, M.L.A., an honorary member of the society, in recognition of the interest which he had taken in getting cheap railway fares to the show-ground.

BRITISH MEDICAL ASSOCIATION.

The monthly meeting of the Victorian branch of the British Medical Association was held on Thursday evening the 30th of September, in the hall of the Royal Society, the president, Dr. L. Henry, in the chair. The election of the following new members were announced, viz., Dr. Simpson Flett, of Fitzroy, and Dr. Cowper Johnson, of St. Kilda. Dr. Neild read a letter he had received from Sir Richard Owen, the well-known scientist, in acknowledgement of a letter of congratulation which, as honorary secretary, he had forwarded to him on his 81st birthday. Dr. Neild read for Dr. Whitcombe, of Ballarat, a paper, entitled, "The Removal of Hydatid Cysts by abdominal section." Dr. Springthorpe read an interesting paper entitled, "Some Points of Interest in the late Epidemic," in which he had collected together a large mass of material in the shape of reports from various medical men both in Victoria and the other colonies on the subject. He suggested that the association should further extend the inquiry by the issue of cards of queries in the manner of the London Committee of Collective Investigation, to be circulated amongst the profession. This suggestion was adopted with a recommendation to the council to carry it out. In the discussion which followed, the president expressed an opinion as to the pathology of the disease, that the affection was in all probability caused by the presence in the atmosphere of an irritant operating upon the pneumo-gastric nerve. All the phenomena, he thought, could be explained on this assumption. The next paper read was by Dr. Griffith, entitled, "Notes on Lunatics as Seen in General Practice." Exhibits were furnished by Messrs. Francis and Co., among which were Koch's *Meat Peptone*, an agreeable form of exhibiting genuine extract of meat; the Extractum Hamamelis Virginicæ, a substitute for the more expensive Hazeline; and a natural and very agreeable mineral water from the Roman Spa near Echzell.

THE ZOOLOGIGAL AND ACCLIMATISATION SOCIETY.

A meeting of the council of the Zoological and Acclimatisation Society was held on Monday afternoon the 5th of October, at the society's office, 69 Temple-court, when there were present :—Mr. Robert Simson (president), Messrs. C. M. Officer, M.L.A., C. Purchas, J. Halfey, F. R. Godfrey, and C. Ryan. The report of the deputation from the council which had waited on the Chief Secretary, and received a promise from that gentleman that he would endeavour to have the sum of £1000 placed on the supplementary estimates for the use of the society for building purposes in the Zoological Gardens was received with satisfaction, and it was explained that such a sum would enable the council to erect several buildings which were greatly needed, and to repair and alter others. Improvements were stated to be steadily going on, and the gardens were reported to be highly attractive at present. The following contributions of stock were stated to have been received since the last meeting of the council, the thanks of which were desired to be conveyed to the donors :—one native bear from Mr. Hugh Gilmour, Broadmeadows ; one rosella and one cockatoo parrot, from Mrs. E. Hines, Royal Park ; two Darling doves, from Mr. J. W. Westwood, Hotham ; one native bear, from Mr. Wm. Bott, William-street, Melbourne ; one monkey, from Mr. Newman, Clifton-hill ; one landrail, from Mrs. Dyer, Brunswick.

THE ROYAL SOCIETY OF VICTORIA.

The Annual Conversazione.

The annual *conversazione* of the Royal Society of Victoria was held on Friday evening the 23rd of October, at the Society's Hall, Victoria-street.

Mr. R. L. J. Ellery, the late president, introduced Professor Kernot, his successor in that position, to deliver his inaugural address.

THE PRESIDENT'S ADDRESS.

The President.—It was appropriate on an occasion like the present to inquire what was a Royal Society, and what were its objects. The Royal Society had its origin under kingly patronage in London more than two centuries ago, since when it had interested itself in all the branches of science, and had included in its membership some of the most illustrious names the world had known. Its methods were accurate observation, conscientious experiment, logical deduction ; and its aim was not the advocacy of a theory, but the discovery of absolute truth. The off-shoots of the parent body in these colonies recognised the same duty, and adopted the same methods. Their legitimate work was to discover and record that which was true, and widen the bounds of human knowledge, to expose error, and to assist the *bona fide* investigator. They might rest assured that the amount of fallacy, error, and prejudice existing amongst us was far greater, and the amount of real knowledge far less, than we

fondly supposed, and the noblest use of life was to expose error and bring truth to light, even if the error was of the most apparently innocent kind, and the truth of the least obvious importance. Lines of investigation of the most apparently useless kind sometimes led to results of the highest practical importance, which would have been altogether missed had the investigator too anxiously asked *cui bona* at the outset. There were lines of scientific investigation in various directions which were at present in a similar state to the science of physics in the days of Galileo or Galvani. Then, again, it must be remembered that the various sciences were mutually dependent. Not only the results, but the modes of inquiry adopted in one direction, often threw new light upon apparently remote questions. The Royal Society of Victoria was now 27 years old, and was in a fairly properous condition. The discussions, however, depended too much upon a few regular speakers, and thus lacked the interest that sprang from variety. The numerous special societies competed with the parent body, and diverted much of our younger talent. However, they ought to rejoice at the numerous manifestations of scientific activity, even though they did not take place under the immediate control of the Royal Society. The society's library continued to increase, and the question of additional accommodation was already in the hands of a committee. A number of interesting and valuable papers had been read during the year. Of the sections, section A was the only one *in esse*, and it was doing good work in discussing engineering questions of the day. The society had lost several members by death during the year, amongst them being Mr. Gilbee, M.R.C.S, (who was one of the founders of the institution), Mr. E. Davy, M.R.C.S., Dr. Edward Barker, and Dr. David E. Wilkie. Of kindred institutions, the Field Naturalists' Club was making steady progress; the Geographical Society of Australasia was busily engaged in important practical work. A Historical Society had recently been constituted. The Geological Society of Australasia has been instituted with success, and already numbers some 100 members. The Pharmacy Board and Pharmaceutical Society had continued their work, and the Microscopical Society rendered valuable aid in a very interesting branch of scientific research. The Industrial Museum and School of Technology and the Museum of Natural History were being steadily extended, and the Schools of Mines at Ballarat and Sandhurst continued to flourish. The Melbourne University, the great centre of higher education for the colony, attracted a larger number of students every year, and increasing activity was found in every branch of knowledge. With the increased accommodation that was so urgently required, and with additional teaching power, our University would have no need to fear comparison with any similar institution in older countries. In astronomical circles the past year had not been a very eventful one. Steady work and gradually-increasing efficiency had characterised it, rather than novel and startling discoveries. No very remarkable engineering work had been initiated or completed during the year. The predictions which he had himself made in December, 1883, as to the relative capabilities of gas and steam engines, and the extent to which the former power would be utilised, had been amply verified, and the latest type of gas engine produced should far excel in economic result any steam engine ever made or likely to be made. In electric lighting the age of extravagent expectations and reckless speculations was over, and had been succeeded by steady, slow, but healthy progress. As a mode of transmitting power electricity had several formidable competitors. As an

illuminant it really should have none, for it was the only illuminant that was unobjectionable from a sanitary point of view. The great question of water conservation still engaged earnest attention. It was to be hoped that in this direction our engineers would hasten slowly, and that the inception of a general irrigation system would not be characterised by the mistakes, disasters, and waste of money that had accompanied some of our domestic and mining schemes of water supply in days past. The systematic gauging of our principal streams was also a work that could be spoken of with unhesitating commendation. What could be more replete with the highest enjoyment, upon what could they look back with greater satisfaction, than a life spent in the search after truth, in combatting error, and aiding the material and intellectual well-being of their fellow men.

PAPERS.

Mr. R. L. J. Ellery gave some notes concerning the planet Jupiter, illustrated by magic lantern photographs.

Dr. Jamieson delivered an address upon the subject of "Condensed and Prepared Foods."

BIBLIOGRAPHICAL SOCIETY OF AUSTRALASIA.

The ordinary monthly meeting of the Bibliographical Society of Australasia was held at Mr. Robert T. Litton's offices, Phoenix Chambers Market-street, on Monday the 26th of October, 1885. Mr. R. T. Litton F.N.S. etc., in the chair. The hon. sec. read the resolution, passed by Bibliographical Society of Australasia at its last meeting, "That the members of the Bibliographical Society be admitted as members of the Historical Society." This question was put to the meeting, and it was unanimously resolved that they should amalgamate with the Historical Society. The following gentlemen were elected honorary members:—The Hon. Ed. F. Litton, Q.C. etc., Col. Ed. Brooke, R.E., of Dublin, William Leathean, F.N.S., of Natal. Mr. Robert T. Litton, F.N.S. etc., was unanimously elected a life member, for his valuable services rendered for the foundation and advancement of this society. It was also resolved that the society recognises and supports the *Australasian Scientific Magazine* as their official organ.

HISTORICAL SOCIETY OF AUSTRALASIA.

The ordinary monthly meeting of the Historical Society of Australasia was held at their office, Phœnix Chambers, Market-street, on the 9th of October, 1885. Mr. David Blair, the president, in the chair. There was also present:—Messrs. Blackburn, Larnach, Bride, Macdonald, Elkington, Litton, and Thomson. After a lengthy discussion, it was unanimously resolved "That the members of the Bibliographical Society

of Australasia be admitted as members of the Historical Society." A committee was formed to carry out the arrangements for the ordinary quarterly meeting. It was also resolved that the Society recognises and supports the *Australian Scientific Magazine* as their official organ. Mr. James Clarke, J.P., of South Melbourne, was elected a member of the Society. Some donations were received with thanks for the library of the Society from the Government and Mr. R. T. Litton.

THE VICTORIA AGRICULTURAL SOCIETY.

The quarterly meeting of the Victoria Agricultural Society was held at the Old England Hotel, Heidelberg, on Tuesday, the 20th of October. Circular letters were received from the agricultural societies of Geelong, Talbot, and Clunes, each requesting the co-operation of this society in urging the Government to increase the grant for the subsidy to agricultural societies to £20,000, which was agreed to, and the secretary was instructed to forward the object. A letter was received from Messrs. Cuming, Smith and Co., intimating that in the coming season they would offer a prize of £5 for the best acre of mangels grown in the district with superphosphate. The offer was accepted with thanks. The secretary reported that the Whittlesea Show had been carried out successfully with a great improvement on previous shows, the draught stock comparing favourably with those at any other country show, whilst the dairy produce was greater in quantity, and of superior excellence. The whole of the proceedings were admirably carried out, and £100 distributed in prizes. Messrs. John Bell, Kangaroo-ground; Joseph Bond, Cleveland; and Job Smith, Northcote, were appointed judges of prize farms. The farms entered for competition were those of Messrs. John Laidley, Bundoora; Thos. Haimes, Bundoora; Wm. Jones, Janefield; Geo. Robertson, Lower Plenty; John Ashton, Lower Plenty; and E. H. Cameron, Kangaroo-ground. The first prize will be £7, the second, the gift of Mr. Job Smith, with whom the scheme originated, and the third, £3. Several accounts were passed for payment.

GEOLOGICAL SOCIETY OF AUSTRALASIA.

The usual monthly meeting of the Geological Society of Australasia, was held at their office, Phœnix Chambers, Market Street, on Monday the 26th of October. There was a good attendance of members present. After the ordinary business had been transacted and the correspondence read, the following gentlemen was elected members of the Society:—The Duke of Manchester, Alex. Browne, F.H.S.A., Professor T. G. Bonny, L.L.D., F.R.S., F.S.A., F.G.S., &c. &c. &c., President of the Geological Society, London; J. Stanley, F.H.S.A., John Finlay, J.P., and Professor W. H. Flower, LL.D., F.R.S., F.R.C.S., F.L.S., F.G.S., &c.

&c., President of the Geological Society, London. An interesting letter was read by the Hon. Secretary, for Sir Lyon Playfair, Bart., who is a member of this Society, on the subject of the British Association's present meeting, for which he is the president. Mr. R. T. Litton also acknowledged the receipt of some 50 volumes of valuable geological works, from a member of the society, the Hon. Ed. F. Litton of Dublin, for which a unanimous vote of thanks was passed. It was resolved after some discussion that the Society recognises the *Australasian Scientific Magazine*, as their official organ. After some interesting conversation on various subjects, the meeting dissolved.

NEW SOUTH WALES.

GEOGRAPHICAL SOCIETY OF AUSTRALASIA.

The monthly meeting of the Sydney branch of the Geographical Society of Australasia was held in the rooms of the Royal Society, New South Wales early last month, Sir Edward Strickland, K.C.B., F.R.G.S. President of the branch, presiding. There was a moderate attendance.

The Chairman stated that the object of the meeting was to listen to the reading of a paper on exploration in Northern Queensland by Mr. Christie Palmerston, a well-known explorer, commissioned by the Queensland Government to inspect the newly reported goldfields on the River Johnstone, with a view of ascertaining their value. Alluding to the work of the Geographical Society, he expressed regret that the society was not more generously supported by the public than it hitherto had been. The work it did was of a very important kind, of which the well-organised expedition recently sent to New Guinea was an example. He was afraid, however, that when the expedition returned to headquarters the society would be very short of funds. He thought the public ought to awake from their apathy in this matter, and support an institution which had a career before it in making known to the inhabitants, not only of the world outside, but of Australia itself, the many wonderful districts which Australia possessed. He contended that much more was known about the dark continent than many parts of this continent. The object of the society was to support the exploration of our land as much as possible, and make known, either by the reading of papers from the explorers themselves, or in other ways, the information which was thus gained. The society possessed a large number of maps and information of all kinds bearing on the colonies generally, which might prove of great benefit in promoting the aims of commerce, if only it had a room large enough in which to display them. Only the other day some valuable information was sought from the society for the promotion of commercial enterprise, and which was certainly obtained, but it was only after a very great deal

of trouble had been expended in rummaging over the treasures which the society possessed. He believed—nay, he was certain—that the society had a future of great usefulness before it, and he appealed to the public to support it, and to assist it in carrying that work out.

Mr. Palmerston's paper on "Exploration in Northern Queensland" was then read by Mr. Percy R. Meggy, for Mr. T. H. Myring, the latter, in whose name the paper stood, suffering from a severe cold. The exploring party consisted of Mr. Palmerston and his black boy Willie, a very smart native of the jungles about to be explored, and Mr. G. E. Clarke, of Herberton, and his black boy Sam, a Flinders River aboriginal of somewhat cowardly tendencies. They started on December 21, 1884, from Herberton, well known for its eminent tin and silver lodes. It stands nearly 3,000 feet above sea level on one of the fountain heads of the River Herbert, which empties itself into Hinchinbrook Channel. The North Johnstone River rises near Herberton, and has many tributaries. It flows through many miles of jungled tablelands of a highly volcanic character, winding about and finally reaching the Pacific in lat. 18.30 S. About four miles from its entrance it forks, large sugar plantations being formed on the the delta of the rivers, while on a very pretty site, at the point of divergence of the rivers, stands the town of Geraldton. The party carried rations of flour, dried beef, tea, sugar, and Liebig's extract of meat, done up in waterproof bags to protect them from the perpetual dampness of the jungles, and slung over the head, each man's burden, including rifle and cooking utensils, weighing about 70 lb. On the second day the party reached a pocket, i.e., a piece of open country about a quarter of an acre in size, circular shaped, where the aboriginals go in for fighting and war dances. Around the margin of the pocket were several gunyahs, oval in shape, and substantially thatched with fronds and coarse grass, and admirably adapted to keep out the rain, which in these districts falls frequently and in torrents. Many large paths lead to the gunyahs from different directions, while in a hole near by was a heap of adult skulls. In another pocket not far distant, situated on an eminence to give it drainage, and kept scrupulously clean, on the roofs of the gunyahs were deaths' heads hung up with twine, and leading to the suspicion that the natives had been recently indulging their propensity for cannibalism. There were also many large wooden shields, painted in rude but gaudy patterns, the red and dark colours being mixed with blood, obtained by irritating the nostril with grass. Swords and spears of the same material could also be seen lying about. On the 26th the party arrived at the new rush, which is situated on a creek emptying itself into the North Johnston, about 18 miles above Geraldton, in a direct line, and between 20 and 30 miles by following the river course. The explorer experimented at the creek, but did not think much of the gold prospects at that point. Pursuing their journey, the party suffered terribly from stinging bush, which stung their bare legs remorselessly, while the jagged rocks which abounded cut their bare feet or their apologies for boots. They were obliged to return to the rush for a refit before proceeding very far. On the Sunday following, January 4, Mr. Clarke left the party, and, fever setting in shortly afterwards, returned to Geraldton for good. On that day eight Europeans arrived from Herberton, after taking 14 days to traverse the 50 miles of jungle which separated the two places. One of the new arrivals had been almost stoned to death by the aborigines, the explorer, accompanied by the two boys, then started on a prospecting tour, and had a terrible encounter with the

natives, who rolled down huge rocks at the party, and got shot in return, two men being killed, one of them being caught as he fell halfway down a lofty precipice by a jagged rock, and there hung. The party then passed through very rocky country, the creeks flowing through rugged gorges, and forming numerous waterfalls and cascades. The scenery was throughout the trip extremely picturesque, the formations of the rocks being frequently of an extraordinary character. The party did not, however, have a very pleasant time of it altogether, as the days were hot and sultry; the nights were frequently very cold, the natives were hostile, snakes and insects abounded, and even the very nuts which fell from the trees, and which occasionally formed their only provender, had to go through extraordinary preparations before their poisonous properties could be expelled. The party crossed the Barron on January 27, and were hospitably entertained at a selector's clearing, where a good meal of civilised victuals was obtained, and the "malignant malaria exploration," as the explorer terms it, was brought to a conclusion, with the resultant conviction in the explorer's mind that there were good prospects of finding gold in the creek beds visited, as also precious stones, although the Chinese miners did not appear to be working in the right direction.

At the conclusion of the paper, for the preparation of which a cordial vote of thanks was awarded to the explorer, owing to the protracted illness of Mr. Maiden the Honorary Secretary to the Society, it was deemed advisable by the Administrative Council to appoint a joint honorary secretary. Mr. T. H. Myring having consented to accept the position, he was appointed Joint Honorary Secretary by the Administrative Council, until the appointment could be confirmed at a general meeting of members. Mr. Harrie Wood moved, and Mr. Hawley seconded a resolution approving of the appointment by the council, and declaring Mr. T. H. Myring joint honorary secretary of the society.

A work on the "Origin and Migration of the Polynesian Nation," by the late John Dunmore Lang, was presented to the society by the widow of the author.

After passing a vote of thanks to the Royal Society for granting the use of the room, the meeting adjourned.

During the week letters have been received from the Queensland Government refusing to send a steam launch in search of the S.S. Bonito and party. Mr. Lawe stating that in accordance with the wishes of the society he had got Mr. Forbes to sign the Society's agreement, and had advanced him about £360 out of the £500 voted by the society to assist him in his exploration of the Owen Stanley Range of Mountains. Mr. Forbes, thanking the society, for vote of £500, and informed the society that he had signed the agreements &c., required by them.

QUEENSLAND.

No reports to hand.

WESTERN AUSTRALIA.

No reports to hand.

SOUTH AUSTRALIA.

THE GEOGRAPHICAL SOCIETY OF AUSTRALASIA.

The South Australian Branch of the Geographical Society of Australasia was inaugurated in the town-hall on Thursday the 22nd of October, in the presence of the Governor and a crowded attendance. An inaugural address was delivered by Sir Samuel Davenport, who gave an exhaustive account of maritime discoveries from the earliest period, leading up to the discovery of Australia. The second part of his address comprised an equally elaborate *resume* of all the land expeditions by well-known explorers and their results. He enlarged upon the enormous advantages to science that had resulted from the exploits of these heroic men, and concluded by hoping that Mr. Lindsay, who is about to cross the continent, would meet with every success. He read telegrams from the other colonies to that effect. The addresses were aided by portraits of those most prominently associated with colonial history from the earliest periods; also by views of many scenes in the interior of Australia. A motion was carried that this meeting heartily welcomes the advent of the South Australian branch of the Geographical Society of Australia, and pledges itself to support and advance the development of the society as one of the public institutions of the colony.

TASMANIA.

ROYAL SOCIETY.

The monthly meeting of the Fellows of the Royal Society of Tasmania was held at the Museum-building on Monday evening, September 7th, 1885. Mr. James Barnard, vice-president, occupied the chair, and about 40 gentlemen were present.

In the absence of the hon. secretary (Dr. Agnew) who was professionally engaged at New Norfolk, the secretarial duties were performed by the curator, Mr. Alexander Morton.

The following gentlemen, who had been previously nominated as Fellows, were ballotted for, and duly elected as Fellows of the Society, viz:—Messrs. Chas. W. Garrard, B.A., Lond., W. Eldridge, W. Duffy, Joseph Tasman Facy.

Papers.

An interesting paper entitled, "Contributory information regarding the tin ore deposits at Mount Bischoff, Tasmania," by Baron Von Groddeck, chief mining councillor of the Hartz mining districts, and director of the Royal Prussian Academy of Mines at Clausthal, Germany, was read by the Curator, in the absence of the translator, Mr. Thureau, who had telegraphed to say that he was unavoidably detained in the country, and so was prevented from attending the meeting of the Society. In a letter from Mr. G. Thureau, F.G.S., to the Royal Society, he stated that the above paper had been published in the journal of the German Geological Society, of 1884. It was a subject he (Mr. Thureau) thought would be of great interest to the Fellows of the Society, so he had, therefore, translated Mr. Groddeck's paper. The Baron states that the Royal Academy of Mines at Clausthal was some time ago placed in possession of a very fine collection of Australian ores, the collection being presented to the Academy by Mr. M. Wajenknecht, a resident of Tasmania. Amongst the samples were found a number of specimens of tin ore, together with the rocks and the minerals said to be associated with same from Mount Bischoff. The Baron says the series particularly interested him on account of a piece of supposed quartz-porphyry, which rock, it was represented, is associated (according to the description of Mr. S. H. Wintle and Mr. Geo. H. F. Ulrich) with those tin ores, and also because of some peculiar, dense, greyish-blue coloured masses of mineral which most frequently are found to enclose those tin ores. The Baron gives a very careful analysis that he made of the specimens he had received.

Mr. C. P. Sprent said the paper was a most interesting contribution, but it raised so many unexpected new points that it would require very careful study before the Fellows could discuss it. He would have liked to have seen some of the specimens which were sent to Germany, because since

Mr. Wagenknecht visited Bischoff more information had been obtained, not only of Bischoff itself, but of the country further south. The specimens, too, ought to be considered in connection with the Meredith Range and Mount Heemskirk. He believed that some of the explanations of the German professor would throw a great deal of light on matters on which there had been great uncertainty, especially in regard to the green rock, which had always—he did not know why—been called chlorite. The professor said it owed its green colour to tourmaline. In confirmation of this, tourmaline occurred at Mount Heemskirk in chlorite veins, which stuck up on the side of the mountain, being harder than the surrounding surfaces. It was curious that at Mount Heemskirk this green rock was found on one side of a vein, while on the other side was quartz rock with tourmaline in it. At Mount Ramsay and the Meredith Range they also found quartz rock full of tourmaline. When the quartz porphyry decomposed it became Kaolin, owing to the large percentage of felspar it contained, a specimen of which he produced. It would be interesting to have the paper referred to Mr. Kayser and other scientific gentlemen, with a request that they should make some remarks upon it. (Applause.)

2. General Observations regarding the Classification of the Upper Palæozoic and Mesozoic Rocks of Tasmania, together with a full description of all the known Tasmanian Coal Plants, including a considerable number of new species. By R. M. Johnston, F.L.S., etc., etc., illustrated by diagrams and maps which were displayed on the walls, and referred to during the reading of the paper.

Mr. Johnston, in the above paper, deals with many important questions connected with the proper classification, and the true relations of the important series of rocks in Tasmania belonging to upper palæozoic and mesozoic age, which include the upper coal measures of the midland and south-eastern parts of the island as well as the lower coal measures, which are well represented in the vicinity, Latrobe, or the Mersey. Elaborate tables were prepared by the author, showing the distribution of all the known coal plants of Tasmania, also of the fossils of the upper and lower marine beds. Sections were also prepared, showing the relations of the principal rocks systems to each other; and the question of the probable age of the greenstone mountains and tiers was very thoroughly discussed, so far as it touched upon the relation with the stratified rocks with which the greenstone masses are so intimately associated. Mr. Johnston gave illustration of greenstone rocks older than the lower marine beds of upper palæozoic age, and others again of a later date than the upper coal measures; he is, however, inclined to the opinion that the massive greenstones of the mountains and tiers have been erupted prior to the deposit, even of the lower members of the carboniferous system. Mr. Johnston, in dealing with the local nomenclature of systems, is of opinion that the finer subdivision names of Europe will not fit the known divisions of Tasmanian rocks, and accordingly with Professor Hutton and others, would prefer local names for the sub-divisions of rocks later than the English "carboniferous." He also pointed out dangers to true classification which may arise by ignoring the facts of local stratigraphy, when dealing with imperfect fossil remains. He urges that questions of local stratigraphy should not be divorced from local palæontology, and that the association of the stratigraphy and palæontology of one hemisphere, is not always a safe guide in the determination of the actual association, in the other hemisphere of stratigraphy and palæontology.

3. Description of two apparently new species of genus Ancillaria, by W. F. Petterd, C.M.Z.S., was read by the Curator.

AUSTRALIA OR AUSTRALASIA.

The following paper was read by Colonel A. Crawford :—

There is a matter that, I conceive, certainly comes within the range of subjects of which our association takes cognisance, and to which many circumstances combine, in my humble opinion, to render its immediate and careful attention most desirable. In the hope that my views may win the approval and support of the Royal Society, I will ask you kindly to read this note at its next meeting, trusting that steps may then be taken to obviate the hazard that to me appears imminent. We are living in the expectation that at a very near date the majority of the Australian colonies —may we not hope all ?—will become federated, and assume a higher position before the world in the dignity and strength that unity confers. Under what title, what cognomen, shall we claim our place among the nations of the earth ? At the first glance, the query might to many appear trivial, and they would probably feel inclined to waive it as one on which they are in no way called upon to decide, whilst they might also consider it will doubtless be satisfactorily dealt with by the Federal Council at its first session. But I am sure that our Society will agree with me that every individual in these lands is or should be interested in the question of our future style and title, and that it shall be both euphonious and correct, and if I can show that a great risk does exist of our being made to appear under a designation every way inappropriate, I think the Royal Society will not hesitate to call public attention to the fact, and bring the weight of its opinion to bear upon the same. I doubt not it will have been noticed by many that in the numerous despatches and telegrams that of late have been passing between the Imperial Government and the Australian Governments relative to federation, two words constantly appear as designating this portion of the globe "Australia" and "Australasia," and they seem to be used by all parties alike as convertible terms, frequently presenting themselves in the same document as, if so used, for the purpose of avoiding tautology. A little reflection, however, will show that these terms are by no means one and the same. Their signification differs *in toto*. "Australia," whilst musical and pleasing to the ear, places at once before the mind the idea of a large and noble southern land, and therefore may be regarded as adequately representing this great portion of Her Majesty's dominions. "Australasia," on the other hand, whilst it might reasonably be applied to Burmah, Siam, Cochin-China, or even India, has in reality no true geographical significance in connection with our great island continents and its sister isles of Tasmania and New Guinea. Let it be remembered that Australia (I cling to that term) is separated from Asia and its islands by an ocean of soundings so deep as effectually to prohibit chance intercourse, and so nature has, in her own unmistakable language, proclaimed these countries by their peculiar fauna and flora to be a distinct region. Why, then, should we in any way, in name at least, allow ourselves to be looked upon as a species of dependency or excrescence of Asia ? Poor relations, perhaps. Whilst our real and only debt to that quarter of the world is limited probably to a few stray cocoanuts, drifted by wind and tide to our northern shores. There would be more reason exhibited in calling Africa "Austral-Europe," than in denominating these colonies "Australasia," for a reference to the map will at once show that the meridians of longitude

within which Australia is comprised are those that mark only the extreme eastern portion of Asia, so that, strictly speaking, Austral does not accurately describe our position in respect to that continent. I will not enlarge further on these points. The little I have said will, I think, suffice to prove that "Australia" is alone the befitting title for this great division of the British realm; and, hoping that the meeting may fully concur in this opinion, I will conclude my note by begging the chairman and members to take immediate action thereon, for if anything is to be done it should be done promptly. A draft of a Federal Council Adoption Bill, prepared by the Premier of Queensland, has been received by the Cabinet, and will no doubt be speedily submitted to Parliament. Whether that bill contains any generic term for our federated provinces I can only conjecture, but whilst we still have the opportunity let us do what we can to insure for our united states a name to which no just exception shall hereafter be made.

Colonel Crawford added that just as the name Hobart Town was altered to Hobart, so the opportunity of federation should be taken to adopt the more euphonious name of Australia for the group.

Mr. Justin McC. Browne called attention of the Fellows to a series of interesting articles in *Notes and Queries*, which appeared a few months since, on the subject of the use of the words Australia and Australasia.

Mr. R. M. Johnston said that statisticians used the term Australasia to mean the Continent of Australia, and the Islands of New Zealand and Tasmania.

Mr. E. D. Swan: And Fiji.

Mr. R. M. Johnston: When such a term was generally used, it would require very great courage to suggest any alteration. It was, however, one which would very fairly come within the scope of the dealings of the Federal Council.

Mr. J. B. Walker said they were indebted to a Frenchman, President De Brosses, for the term Australasia, he having conferred it in 1756. He had brought down a book "Histoire des Navigatiors aux Terres Australes," Paris, 1756, showing the charts of that day for the inspection of the Fellows. Australia now, as he understood it, was used for the Continent and Australasia for the larger group. He did not know whether the shorter term being more euphonious would be sufficient reason for altering it.

Colonel Crawford: But we have nothing to do with Asia at all. If you have anything call it South-eastern Asia. It makes me writhe to think of the incongruity. A Frenchman may have introduced the word, but I won't be guided by any Frenchman. (Laughter.) A century ago, too—what did he know about it? (Renewed Laughter.) Let us use our own common sense. We are famous for misnomers in this island.

The Chairman said no doubt the Colonel's remarks would elicit discussion and call attention to the subject, and so he would attain the object he had in view.

ORNITHOLOGY.

The Curator stated that the Council of the Royal Society had received during a month a letter from the President of the Intercolonial Permanent Ornithological Committee, Vienna, which he would read to the Fellows, in doing so he was of opinion that among the Fellows of the Society were many close observers of the habits, etc., of the birds of Tasmania, and the co-operation of those gentlemen, would materially assist the object,

that the Vienna Society were desirous of carrying out. The letter was as follows :

Sir,—The first International Ornithological Congress at Vienna has resolved upon creating an international Permanent Ornithological Committee, whose task it is to establish a net of ornithological observation stations, embracing the whole inhabited world. Extremely difficult as this task appears to be, we, however, think to realise a happy solution, encouraged by the exceedingly kind favours bestowed on us by most of the Governments, and relying upon the mighty protection of our High Protector. But such a solution is, however, only possible, if everybody, who has the progress of science at heart, will energetically assist the committee in their assiduous exertions of completing this great work worthy of the working together of all mankind. We therefore confidently think to do no false step by applying to you with the kind request to look for men in your circles, who have the mind and intelligence of undertaking this meritorious task by regularly observing all the birds of their surrounding countries, referring to their occurrence, trains, hatchings, and ways of life, and sending those observations annually (every first quarter of the calendar-year) to the secretary of the committee. Dr. R. Blasius, President I.P.O.C. Vienna.

The Chairman said that Colonel Legge, Mr. Swan, and other ornithologists, would, no doubt, give the writer the benefit of their researches and observations, and bestow attention on the very interesting questions raiscd by it. The letter would appear in the report of the proceedings, and would receive the attention it deserved from the Fellows.

VOTE OF THANKS.

On the motion of Mr. C. H. Grant, seconded by Mr. J. B. Walker, a vote of thanks was passed to the readers of papers and donors of contributions to the Museum.

The Editor's Chair.

An interesting lecture was delivered by Mr. H. B. de la Poer Wall, M.A., P.R.G.S., head master of Hamilton College, at the Town Hall, Hamilton, during the present month. The Birth of the World was the subject of Mr. Wall's discourse, which was received with much appreciation by a large audience.

Irrigation for Pastoral Purposes.—Mr. Garden's successes at Cohuna, followed up by those of Mr. Duncan Leitch at Gunbower, are producing their natural fruit by encouraging land owners in the neighbourhood of the River Murray to invest largely in irrigation plants. From the *Riverine Herald* we learn that a public trial of the irrigating plant of Mr. F. Wentworth, of Uardry and Burrabogie stations, was made on October 2. The barge in which the pumping machinery is placed, was moored in the dock, and the wharf was lined with spectators, who evinced the greatest interest in the proceedings. The machinery commenced working as soon as the steam was allowed to enter the cylinders, and directly afterwards a fine body of water was thrown from the delivery pipe. The pressure of steam ranged from 90 to 95 lbs., and when the engines were working at full speed the delivery was computed at 12,500 gallons per minute, equal to about 50 tons, to a height of 10 feet. The water came out in a solid body, which would flood an acre of land to a depth of 1 in. in about two minutes. The delivery of course lessens as the height increases, but the pump is guaranteed to throw 5000 gallons to a height of 30 feet. The engines worked very smoothly, and Mr. D. Chrystal, of Torrumbarry station, who represented Mr. Wentworth, expressed his entire approval with the manner in which Mr. Whitehead and his foreman (Mr. Earnshaw) had carried out the work of erecting the plant, and with the success of the test.

Payable Coal in Victoria.—Indications have recently very rapidly multiplied, all tending to prove that there is abundance of payable coal in the neighbourhood of the Cape Otway ranges, and that in a very little time Victoria will be independent of Newcastle supplies. We observe that Mr. Begnell, of Belfast, who with Mr. J. P. Palmer and others, was a prospector and promoter for and of the company recently started in Warrnambool, has, according to reports, made a new discovery. The paragraph which we refer to, and which has been going the rounds of the papers, reads as follows:—"What is at present believed to be one of the most important discoveries of coal yet made in the colony has just rewarded the searches of Mr. Begnell, a well-known prospecter in Cape Otway Forest. Mr. Begnell reports that he has found seven seams of coal in the vicinity of Apollo Bay, varying in width up to 18 inches. The principal seam is within one mile from the jetty, which is now being

lengthened by the addition of 600 feet. Mr Bignell has brought some specimens of the coal to Warrnambool. He has undertaken to supply 20 tons to the contractors for the jetty there. One of the seams is a continuation of that first discovered in Victoria." Our latest information in regard to the doings of the Cape Otway Coal Mining Company, of whose directors Mr. W. S. Helpman is chairman, is of a most satisfactory character; but still better developments are being waited for, before the venture is placed upon a footing that will let the public in on terms sufficiently profitable to the promoters. We hear also that Ballarat enterprise and capital are likely to be engaged in Cape Otway Coal prospecting.

The heliotrope has evidently been elected queen of flowers in the world of fashion for the present season. We hear that its sweet odour is to reign supremely in ladies' sachets, and, it may be presumed, in the toilet-box of the "masher." Now it is unfortunate that even the olfactory nerves, which are by no means the least sensitive and discriminating of human organs, should thus be led into slavish compliance with fashion's whims. Heliotrope—nothing but heliotrope, when the variety of perfumes is so great! Sweet though it be, even the dullest nose must feel the inconsistency of recognising "fashion" in a scent. One of the keenest pleasures to the sense of smell is that derived from a good, old-fashioned flower garden, and what is the reason of its charm? It is that the many varied odours are so blended that it would be almost impossible to award the palm to any one flower—either the honeysuckle, jasmine, carnation, lily, or the rose. We can imagine the feelings of old James Hervey—who wrote "Reflections on a Flower-garden," and delighted in the balmy fragrance that "not only regales the sense, but cheers the very soul"—were he here now to know that a particular scent should be the "fashion." But the heliotrope, whose perfume, by the way, we do not wish in the least to depreciate, is also to set a scale of colour. Ball dresses, tea gowns, and dinner dresses, in a great variety of materials, have taken its hue, and very delicate it is combined with such contrasts as gold embroidery, gold ornaments, white satin, or leaves of rich-toned brown.

We hear that one of the most widely known of the popular publishing firms has in contemplation certain changes which will revolutionise the profession of authorship so far as this particular firm is concerned. The unpunctuality of those who follow the calling of literature is proverbial—justly or unjustly—and the particular house to which we refer has suffered as much as any of the other publishers. It deals with a multitude of literary people, and most of them disappoint its business managers in point of time. The supposed cause of the evil is want of method on the part of the authors. And what the firm contemplates, as we are told, is to have all its work done upon its own premises, except where the writer with whom it contracts is one whom it cannot bring down to that level.

Reports from Alberta district, at the eastern base of the Canadian Rocky Mountains, state that though having some fifty thousand head of cattle the amount of butter manufactured in Alberta does not nearly supply the local demand, and this summer farmers found a ready sale for all they could make at from 35 cents to 50 cents (1s. 5d. to 2s.) per pound. The high price of dairy cattle may in some measure account for the fact that a greater number did not undertake dairy farming last season, but a large number of cattle were imported this year, and in a short time the local markets will be supplied by home produce. The

butter manufactured by the farmers around Calgary is equal, if not superior, to any make in the Dominion, and those engaged in the business express themselves highly in favour of the country and its adaptability for dairy farming. There is held to be room for thousands of dairy farmers in Alberta, and capital so invested will, it is believed, insure good interest. That the manufacture of cheese has not commenced before now is chiefly owing to the rapid development of the country. Practical men who have settled in the district this year profess themselves so pleased with the inducements that they intend starting in the business next season. Alberta possesses every essential necessary for the production of first-class cheese; grasses of the richest and sweetest description, and innumerable streams of the purest and coldest water.

The colony of New South Wales contains an abundance of soil of the richest description for the support of a very large population, when the conditions shall be more favourable for the pursuit of agriculture, for which in most districts the climate is very suitable. On the coast strip eastward of the dividing range there is a large area of very rich land in the river valleys. It has been extensively cleared, and in the southern part of the colony is mostly under lucerne, corn, and potatoes, and yields immense crops. On the northern river-flats splendid crops of sugar-cane are grown, as well as of corn. The tobacco plant flourishes on this strip of land, as well as almost all the cereals and fruits of temperate and semi-tropical climates. Wheat crops formerly were grown extensively here, but for many years past the area planted with wheat has been very much reduced, owing to the extreme liability of the grain to rust when coming into ear. It is this that has doubtless rendered the production of wheat in the colony so far behind the yield of the southern colonies. However, when we get on to the table-lands we find a large area of soil of very rich quality among the surrounding rocks and country of granite formation, and this promises to be the future granary of the colony. At present the yield of the crops in some instances amounts to as much as 30 and 40 bushels per acre from the virgin soil of this part of the colony. Here flourish the English fruits—gooseberries, cherries, currants, and the like. As you go further westward the climate becomes less and less favourable for agriculture, owing to the uncertainty of the rainfall, and, as far as present appearances indicate, the great salt bush plains of the interior, unrivalled for fattening stock, will for generations to come be chiefly devoted to that pursuit. With regularity of seasons, agriculture might be possible; but the rainfall is very irregular in that part of the colony. Briefly summed up, we may say that the coast climate and soil favour the production of almost all kinds of vegetation found in temperate and semi-tropical regions; that the table lands, with a magnificent climate, will produce all the cereals and fruits of the temperate zone; while away westward are hundreds of thousands of square miles of the finest stock-fattening country to be found in any part of the world.

Ye Narcissus or Daffodyl Flowre, and his Roots.—Under this quaint heading, Mr. Peter Barr, the head of the firm of Messrs. Barr and Son, 12 King-street, Covent Garden, W.C.; assisted by that excellent authority, Mr. T. W. Burbridge, the curator of the Trinity College Botanic Garden at Dublin, have just published an interesting pamphlet on the history and culture of the daffodil, now so popular because of its varied and charming hues of yellow and orange. It comprises the lecture on the narciss delivered by Mr. Burbridge on the occasion of the Daffodil

Conference held in London last year; it also gives useful cultural notes, together with the rules for the hybrieisation of narcissi; a chapter on the poetry of the daffodils, and finally an illustrated descriptive catalogue of all the wild species, hybrids, and garden seedlings known in English gardens; and in order that this might be as complete as possible, it covers a period of about 300 years. We have read this pamphlet with great pleasure; and to anyone who may be interested in this charming flower it will be of value as a work of reference. We regret that space does not admit of our giving extracts, but as it is published in a cheap form it is thus placed within the reach of all. It is published by Messrs. Barr and Son, at 12 King-street, Covent Garden, W.C.

No copper ore was raised in Victoria during 1884, but it is expected that a considerable quantity will be produced before the end of the current year from the Granya and Bethunga mines. Interesting descriptions are given in the report of the mode of treatment now adopted at those mines to extract the gold from the copper ores, which contain such a combination of minerals as to have baffled all previous efforts to separate the precious metal. Many samples of supposed tin ore are brought in from time to time to the department for analysis, but they usually prove to be nothing more than black ironstone. A sample from Neerim, Gipps Land, gave better results, showing 62 per cent. of tin. The total quantity of tin raised in the colony during the year was only 44 tons 16 cwt. No lead ore was raised in Victoria during 1884, 1600 tons of iron were produced.

The discovery of payable seams of coal in Victoria, which has hitherto appeared to be very remote, seems now to be well within the range of probability. The efforts made during the year in that direction have met, however, with no very definite results. Seams varying up to 2 ft. or 2 ft. 6 in. in thickness were cut by the diamond drill in the Cape Patterson district, but the quality has been uncertain. The most important discovery during 1884 was made at Mirboo, Gipps Land, where a seam about 4 ft. 8 in. thick, divided by a thin clay parting in the centre, was met with. Two specimens of coal from this locality were submitted to Mr. Cosmo Newbery. Regarding the first specimen he reported that the coal burnt well and yielded a large quantity of gas, but the ash (25·88 per cent.) was too high for a good coal. The second sample, submitted by Mr. Norman Taylor, gave better results. This showed an excellent coal, the percentage of ash being only 6·67, and Mr. Newbery suggested that a further test should be made. The Moe Coal Company have been steadily engaged in opening up their mine upon a seam showing an average thickness of from 2 ft. 3 in. to 2 ft. 8 in. of first-class coal. It is considered that the construction of the proposed Narracan Valley railway line, which will pass near the mine, is all that is now necessary to enable its successful development to be accomplished. Only a comparatively small quantity of coal has yet been raised in Victoria, viz., a little over 13,000 tons.

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